Conference Synthesis

Moderator's Overview

Jeffrey Kahn
University of Minnesota
Minneapolis-St. Paul, MN

This is an interesting challenge: to provide an overview and capture themes of the past few days, some of the "golden threads."

Biotechnology's Promise

The promise of biotechnology is obviously a very important thread that ran through the entire meeting, and that term has multiple meanings. It's not just about promise, it's about the promises we make. It's about public perception—about how we as members of the public perceive what's being done in biotechnology, in particular in terms of food. It's about the distinction between food on one hand and nutrition on the other, which is something that I had not fully appreciated until this meeting. And it's about shared responsibility and, most importantly, trust. We've heard that stated so many times, but I think it's almost impossible to overstate its importance. Obviously, trust is a key factor.

We heard much about promising aspects of agricultural biotechnology and about functional foods, and how we should think about differences between putting supplements into food versus taking them as medicines as pills, and how that is a leap that technology will offer. We have to think differently about functional foods and nutraceuticals. Merging healthful eating with medicines in our foods is part of the promise of biotechnology—we learned a lot about food-based products that may have medicinal capacity. Biotechnology and agriculture offer new ways to make vaccines, more cheaply, more effectively, and with greater capacity, actually *growing* medicines, or "pharming." The take-home message is that although agriculture and health—in particular, public health—have always been linked, a new relationship is evolving that requires interdisciplinary approaches and new thinking. Who should be involved and what should they be thinking about?

We have heard about the promise of biotechnology and we have to consider what promises we are making to the public, to producers, and to all others involved in this endeavor; are we promising too much? Whose responsibility is it to ensure that the promises of biotechnology are actually realized?

Responsibilities Shared

We have shared responsibility for a number of things. First and foremost for safety. How do we decide what counts as safe in the context of foods for health? That is a very important question that, from the perception of the public, we have not yet answered. How do we measure safety? We saw calculations for what contamination might be expected from crops that cross-pollinate, but how do we measure that in a way that will provide a sense of what counts as safe? First of all what are the criteria, and how are they measured such that people will understand?—whoever is at the table will strongly influence what is acceptable in terms of the answers to these two points. And we heard that, just as real estate is about location, location, location, functional foods are all about process.

We must have a process that people can support, which goes back to those other points. Therefore, the chief issues are:

- who's involved,
- what are the criteria,
- how do we measure safety, and
- is the process credible?

We have shared responsibilities in terms of being accountable for how this progresses. Our promises must be realistic. Some people argue that we are over-promising, that we are hyping—which certainly is true in stem-cell research, for instance. If we are promising more than can ever be realized, it is for reasons that are not entirely objective—it results from attempts to obtain funding and to garner popular support, which raises political and moral issues and may result eventually in finger-pointing.

Responsibility runs all the way through the chain, including producers, industry, and regulators, which raises the question of whether the present structure is up to the task of assuring this shared responsibility. Can we say to concerned individuals—which should be all of us—that we have a process, a structure, in place that will help answer these questions? Can we point to who is accountable and why? We need to have a process in place to assess what's working, and what's not, and to decide what is to be done when we have answers to those questions. It's an evolving process.

Public Perceptions

All of this, of course, is influenced very heavily by public perceptions. "Who is minding the store?" is a colloquial way of asking if someone is appraising issues

of safety and accountability. Who is doing that for the public-perception issue? We have heard a great deal about risks, not only to our own health and that of our children, but also to the environment. How do we assure that the public understands what those risks are? To answer that question, we have to go back. We can't tell people what the risks are until we know how to answer these questions. We are stuck way back there, before we can ever make it to here. How can people be told what the risks are when we haven't set criteria for risks?

Risk to health, of course, is a huge issue, and risk to children's health obviously falls under that as a subheading. Also people are worried about risks to the environment at large. People want reliable information from trusted sources, meaning credible and objective, or at least perceived as being objective. And, from the public perspective, where is that oversight coming from?

Communication is an important factor in public perception. We know that words matter: "biotechnology" is an acceptable term whereas "genetic engineering" and "genetically modified food" are less acceptable. Genetic engineering and nuclear power are equal in popular acceptability. We have to use different words or educate people differently. It was important to be told that "we are not talking about a plate of risk factors, we are talking about a plate of food." In other words, we have to be careful how we use terms. Risk factors apply to food in general, not genetically modified food in particular. A fundamentally important question is: who is responsible for getting such messages into people's homes, and into people's heads? The media have assumed that responsibility, but it is also the responsibility of the community as a whole.

Food and nutrition are not necessarily synonymous in people's minds. We all eat. One of the reasons that this issue resonates is because food is something we all buy, sometimes grow, and we all consume. When things apply universally they tend to get particular attention. In the same way, on the health side, people get up in arms about the role of genetic information because we all have genes and genetic testing may affect all of us.

There is a cultural aspect to food, and rituals and traditions are not to be trifled with. When we talk about modifying food we have to consider possible cultural implications. The take-home message here is, "Don't mess with my food."

We eat for health, not to cure sickness. We don't eat bananas because we feel ill. We eat them because we know they'll help keep us healthy. We should not think that people will eat for health at the expense of other considerations, like taste. My wife expressed it like this: "I go to Whole Foods, but if what I buy there doesn't taste good, I won't buy it again even if it is wholesome and organic." Obviously, these are the most important factors. It's got to taste good, and it has to be safe.

Trust and Its Preservation

Clearly, a package of concepts is involved, that may be labeled under the heading of trust. And this is where we should focus. It's about trust at every level, most significantly trust on the part of the public, the consumers of genetically modified foods. If they don't trust it, they won't buy it. They want to be assured of effective oversight. We heard about authentication of food—an interesting concept and one that we've worked very hard at in terms of medicine. Maybe it's not always deserved, but when a medicine is on the market we feel that it is safe, having gone through an authentication process. As foods become more like medicines, will a similar authenticating process apply? To preserve trust, the authentication process will have to be transparent and public. And although it's always better to be open, it's not always achievable, especially at large institutions. When the newspaper reporter calls, our first reaction often is, "I don't want to talk to you," or we get defensive. But, generally speaking, this is not the best approach. It is better to be transparent, to be public about what we do—to communicate effectively with reliable information. When bad things happen, it's not appropriate to pass the buck. We must show that there's accountability for when things go well and when they go poorly. We can all point to events in our own lives, in our own institutions, and in the world at large that demonstrate that when trust is undermined it is extraordinarily difficult, sometimes impossible, to recapture it. The Starlink™ corn debacle is a good example. Popular brands of tacos are still viewed with suspicion—that's trust lost.

Producers need to trust that what they produce they can actually sell, otherwise they won't plant it. And there has to be a process by which they feel like what they are sowing is authenticated through oversight and regulatory processes. And producers must be trusted by the public so that the latter feels that their food is wholesome.

As already stated, trust in the regulatory and oversight processes is essential. If the US Department of Agriculture (USDA), the Environmental Protection Agency (EPA) and the Food and Drug Administration (FDA) have a consensus on oversight and regulation of foods for health, than it needs to be regulated accordingly. And gaps found in the system need to be fixed; again, Starlink™ is a good example. The public good—or the public goods, as they are sometimes plural—must be protected, the main considerations being human safety and environmental safety. The regulatory process is supposed to protect what we think is important, not as individuals necessarily, but as a collective. We also have to trust the professionals who work in these areas. Those in agriculture and health and nutrition and science all must be deemed trustworthy, and equally so, for this to work. The costs of mistrust are extraordinarily high. What is going on in Europe is an example of what we ought to hope to avoid.

Benefits Lost?

If we fail to adopt new technologies, then we will forgo real benefits. That side of the coin is often not articulated clearly enough—it's not only about economic costs, its about loss of benefits. If we don't adopt technologies that could be beneficial to health, then people will get sick and, in certain cases, die needlessly. Where does the balance lie? Risks need to be considered against potential loss of benefits. If there is public mistrust, then research funding will be affected in the long term. We heard that National Institutes of Health (NIH) will double its budget over 5 years, but is the public sufficiently sophisticated as to understand that the Starlink™ problem, for example, is not NIH's responsibility? And if there's a problem with human-subject research, could that affect funding for agricultural biotechnology? Interdisciplinary collaboration will be essential—involving scientists, producers, policy makers, social scientists, and industry—not only nationally, but also internationally. And it must be integrated such that producers, for example, are not solely responsible for a particular aspect.

The most important aspect is transparency in what we do: tell what we know and what we don't know. We must communicate what the risks are, even though many people are unwilling to accept some risk in their lives. On the other hand, we drive our cars blithely in ways that are much more risky than the tiny amounts of allergens that might be in our corn products. We have to give people a real sense of what the risks and the benefits are and tell them what we don't know. In addition to transparency, there needs to be accountability: who is responsible and for what? If the professions and industry won't exercise accountability, then Congress will step in, and we don't want that to happen. They are not the right people to make rules about how these things are done. It is better to be proactive to protect the public good. And if we do that, if we keep our promises, then consumers will adopt this technology, and funders like the National Science Foundation will continue to invest money in the research, and, hopefully, the promise of biotechnology will overtake the hype.